

CLAIMS

WHAT IS CLAIMED IS:

- 1 1. A planar lightwave circuit comprising:
 - 2 a first portion of a waveguide;
 - 3 a second portion of waveguide; and
 - 4 a segment of crystal core fiber coupling the first portion of the waveguide
 - 5 with the second portion of the waveguide.
- 1 2. The planar lightwave circuit of claim 1 further comprising:
 - 2 an optical index-matching gel disposed between the segment of crystal core
 - 3 fiber and the first portion and second portion of the waveguide.
- 1 3. The planar lightwave circuit of claim 1, wherein the segment of crystal core
- 2 fiber has a principal optical axis disposed at approximately a 45-degree angle with the
- 3 planar lightwave circuit.
- 4 4. The planar lightwave circuit of claim 1, wherein the planar lightwave circuit is
- 2 an array waveguide grating.

1 5. The planar lightwave circuit of claim 4, wherein the segment of crystal core
2 fiber is disposed at a mid section of the array waveguide grating.

1 6. The planar lightwave circuit of claim 5, wherein the segment of crystal core
2 fiber is disposed in a V-groove substrate.

1 7. The planar lightwave circuit of claim 4, wherein the segment of crystal core
2 fiber has a length that satisfies the equation $(2m+1) * \lambda / (2 * \Delta n)$, wherein m is any non-
3 negative integer, λ is a wavelength of an optical signal in an optical communication
4 waveband range, and Δn is a measure of birefringence of the segment of crystal core
5 fiber.

1 8. The planar lightwave circuit of claim 7, wherein the optical communication
2 waveband range is approximately 800 nm to 1700 nm.

1 9. The planar lightwave circuit of claim 7, wherein the segment of crystal core
2 fiber comprises quartz, lithium niobate, lithium borate, beta-barium borate or other
3 inorganic substance.

1 10. The planar lightwave circuit of claim 7, wherein the segment of crystal core
2 fiber comprises an organic or polymeric substance.

1 11. An array waveguide grating comprising:
2 a plurality of waveguides;

3 a V-groove portion of substrate having multiple segments of crystal core
4 fibers inserted into a section of the plurality of waveguides.

1 12. The array waveguide grating of claim 11 further comprising:
2 an optical index-matching gel disposed at ends of the multiple segments of
3 crystal core fibers.

1 13. The array waveguide grating of claim 11, wherein the V-groove portion of
2 substrate is inserted at a midway point of the array waveguide grating.

1 14. A method of correcting for birefringence in a planar lightwave circuit, the
2 method comprising:
3 removing a section of the planar lightwave circuit; and
4 inserting a portion of crystal core fiber into the planar lightwave circuit.

1 15. The method of claim 14, wherein inserting the portion of crystal core fiber
2 further comprises:
3 positioning the portion of crystal core fiber to have approximately a 45-
4 degree angle between an optical axis of the portion of crystal core fiber
5 and a substrate plane of the planar lightwave circuit.

1 16. The method of claim 15 further comprising:
2 inserting an index-matched gel between the portion of crystal core fiber and
3 the planar lightwave circuit.

1 17. The method of claim 14, wherein the portion of crystal core fiber is disposed
2 in a V-groove substrate.

1 18. The method of claim 17, wherein other portions of crystal core fiber are also
2 disposed in the V-groove substrate.

1 19. A method of correcting for birefringence in a planar waveguide, the method
2 comprising:

3 directing an optical signal down a first segment of the planar waveguide;
4 changing a polarization of the optical signal by directing the optical signal
5 through a portion of crystal core fiber; and
6 directing the optical signal down a second segment of the planar waveguide.

1 20. The method of claim 19 further comprising:

2 reducing loss of the optical signal between an interface of the portion of
3 crystal core fiber and the planar waveguide by using an index-matched
4 gel.

1 21. The method of claim 19, wherein the length of the portion of crystal core fiber
2 satisfies the equation $(2m+1) * \lambda / (2 * \Delta n)$, wherein m is a non-negative integer, λ is a
3 wavelength of the optical signal, and Δn is a measure of birefringence of the portion of
4 crystal core fiber.

1 22. The method of claim 21, wherein λ is in an optical waveband range of
2 approximately 800 nm to 1700 nm.